

Computer-Aided Designs (CAD): Printing and Production of Cut-Wood Motif on Fabrics

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ABSTRACT

Fabric decoration is an art that has existed for many centuries but usually done manually. Before now, most Artists used conventional methods of art production, which is cumbersome, tedious, time consuming but with the introduction of Computer-aided design in textile arts, the whole design process become easier and more efficient as well as ensures precise and accurate reproduction of the artwork also in creating more striking and intricate designs that translate into beautiful fabric decorations. Hence, Computer-aided design software (CAD) is an invaluable application for textile design and fabric decoration. This study computer-aided design: printing and production of cut-wood motif on fabrics, aims at developing motifs from the woods fell at different locations in Anambra State Polytechnic, Mgbakwu. The motifs developed are arranged into appropriate repeat patterns, then digitally transferred into CAD software for colours separation and finally printed on laser films for production. It employed the textile techniques of screen printing process. The experiment at the end resulted in fully designed fabrics and interior decoration items ready for the market. The study serves as a resource material as well as an inspiration for designers/researcher working on projects of complex designs with great precision to explore computer-aided design software and for further advances in the field of textile arts.

KEYWORDS: *Computer-Aided Design Software (CAD), Cut-Wood, Motif, Fabric Decoration and Textile Design*

INTRODUCTION

Various phenomena and contradictions in our world today beg for exploration and explanation, Artists have responded to these situations with the aid of technology. They are experimenting with new materials in good response to the environment (Nwanna, 2014). Ironically, nature most times presents itself as the resource base from which creative ideas are inspired and wood possesses resourceful virtues, from which ideas could be tapped to create designs and patterns that can be used to beautify our homes as well as transform our environment. Wood is one of the world's most economically important plant products. Many generations have benefited immensely from its great potential. It provides lumber, pulp, paper, charcoal, fuel (firewood), and other related products like methanol (wood alcohol), methane, acetic acid,

acetone, lacquer, ink, paint, fabrics, spices, dyes, drugs, tannins, to mention but a few (Gordon, 2001). It has been variously used for many years as a medium of art production; for musical instruments, sculptures, and carvings, as a painting ground, for example, in panel painting, as well as for printmaking and engraving. Textile designers also use various features of trees for their design motifs (Ekwezia, 2023).

Most of these Artists/designers used conventional methods of art production, which is cumbersome, tedious, time consuming but with the introduction of Computer-aided design in textile arts, the whole design process become easier and more efficient as well as ensures precise and accurate reproduction of the artwork. It creates more striking and intricate

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designs that translate into beautiful fabric decorations. Computer-aided Design (CAD) is a software program on the computer used for various purposes in the field of textile and fashion, engineering, and architecture. Aanya (2021) stated that “Technological integrations have always been quite beneficial for many industries and especially the Textile. Such technological advancement can increase the efficiency and productivity of teams and contributes to better quality in designs and processes”. Jack Appleton (2021) also affirms that “until relatively recently the textile industry was the leading industry in terms of technology. The first computer and the first automated machines where in the textile industry, CAD is critical to the industry worldwide, in determining patterns, cut patterns to avoid waste, to design specialized equipment for a specific task at a specific factory etc”

Furthermore, CAD was introduced in the early 1950s by Douglas T. Ross, a researcher at the Massachusetts Institute of Technology (MIT). Ross worked on projects that pioneered early CAD technology – such as Automatically Programmed Tools (APT), which led to the creation of AED (Automated Engineering Design). The first true CAD software was called Sketchpad, developed by Ivan Sutherland in the early 1960s as part of his PhD thesis at MIT (Massachusetts Institute of Technology). Sketchpad was especially innovative CAD software because the designer interacted with the computer graphically by using a light pen to draw on the computer’s monitor. This application software originally was solely used in designing high precision machinery before it found its way in other industries and in the 1970’s it made an entry in the textile and apparel industry. In fact, according to national Knitwear Association of US of 228 apparel manufacturers ; 65% use CAD to create colour ways, 60% use CAD to create printed fabric design. 48% use CAD to create merchandising presentation, 41% use CAD to create Knitwear Design (Sayed, 2014).

The integration of technology in textile industry has led to increase in productivity and the potential for greater creativity in the design process as well as enable a great degree of accuracy and precision in fabric decoration. CAD enables a designer to create, modify and analyze intricate designs effortlessly. It improves the design quality and simplifies the process of creating unique designs to a large extent. Omer (2020) asserted that “CAD basically, is a computer software program that helps textile designers create knit, printed, and woven patterns. CAD technology allows the creativity of the textiles designers to run free; hence it is being used more and more in textile

industry”. In addition, Kiron, (2021) opined that “CAD helps designers to create whole garments, design printed patterns for textile and create specific weave and knit patterns”. Panneerselvam (2010) is of the opinion that “in today’s world computer-aided designing (CATD) becomes versatile for all the designing and weaving industry. The process involves the use of computers in design, development and manipulation of motif. The motif can then be resized, recoloured, rotated or multiplied depending on the designer’s goal.

Lungu, Androne, Gurau, Racasan, & Cosereanu, (2021), wrote on “the use of computer-aided methods for the transposition of ornaments inspired from the textile heritage into the surface furniture decoration” for the preservation of cultural heritage from their region using two processing methods laser engraving of wood and CNC routing of wood. The experimental works provides the complete image of aesthetic, surface quality and technological cost. In addition, Badoe, Mensah & Bornno-koku, (2015) in their paper titled “Arts and Design Studies Design and Production of Textile Mural: Combination of Computer Aided Programmes and Conventional Methods, An Alternative Innovative Approach”, conducted a study of mural production technique using the combination of digital printed fabric on flex sheet with conventional appliqué and embroidery techniques. They made use of exploration and experimental methods in the execution using the Faculty of Art, College of Art and Built Environment, KNUST as a case study with the intent to promote and educate the populace. This work was set to address the cumbersome, tedious, time consuming processes involve in conventional production of textile mural; cutting of pieces of textile materials and fixing them onto a substrate by appliqué and embroidery techniques. The importance of this alternative method is that it takes care of all the setbacks in the convention method as well as ensures precise and accurate reproduction of the work.

Masenska, Sostar-Turk, & Tavčer, (2008) stated in their paper titled “Printing and design in the processes of textile inkjet printing,” reviewed the current and future trends of textile digital ink-jet printing, and compared the production costs of different ink-jet and screen printing technologies. The digital design process and the parameters for transferring ink-jet printing technology to screen printing processes were described and result showed that using ink-jet in screen printing is quick and précised. This study Computer-Aided Design: Printing and production of cut-wood motif for Fabric Decoration was birthed when the researchers perceived that trees around the

Anambra State Polytechnic, Mgbakwu were fell indiscriminately and the need to utilize this gift from nature especially now that most of the trees are cut as a result of classroom buildings and road construction, owing to the location of the school and her long standing history of college of agriculture with trees in and around its surroundings. The new institution needs to showcase itself as well as carve out a niche amongst other tertiary institutions. In order to ensure zero wastage, every aspect of cut-wood starting with trunks, branches, and roots will be utilized as soon as they are fallen before interference with human.

From existing literature, it has been discovered that not much has been done on the use of computer-aided design for fabric designs in many institutions of higher learning. The purpose of this study is to improve the pedagogical methods in textile arts to support the development of creative skills and foster an entrepreneurship development in the institution and it will also expose the students to learning the science involved in cloth printing production. The following steps will be utilized in achieving the set objectives; collection of samples and pictures of cut-

Primary Source



Plate1: The source of inspiration (Wood)

Studio Exploration

To achieve the set objectives, different stages such as collection of sample pictures of cut-wood from different sites in the Institution, making of preliminary sketches the thumbnail sketches, the colour test and the use of CAD for colour separation before the designed is finally printed on fabrics

Stage 1: Thumbnail Sketches

This stage involves the initial developmental sketches of the designs to guide the work as shown in (figures 1 & 2) the thumbnail sketches enables the artist explore by drawing processes, the forms and patterns of wood in order to develop motifs for textile designs. This was made on paper from the source of inspiration. These were later rearranged into different patterns to create designs



Figure 1: Thumbnail sketch with its mirror repeat pattern

Medium: Pencil on Cardboard

wood, exploring by drawing processes, the forms and patterns of wood in order to develop motifs for textile designs, determining the appropriate repeat pattern that will be suitable for textile design production, identifying the suitable colours and implementing the CAD colour separation strategies to achieve the desired effects and explore the wood designs on fabric using printing techniques.

Materials and Methods

Materials used for this research include drawing board, cardboard sheets, pencils and pens for making designs, masking tape, paper gum and office pins for attaching paper on the board. Sable brushes for applying colours on the designs made on cardboard sheet, palettes for mixing colours, cutter for cutting off the finished paper designs from the board, and tracing paper for transferring designs from sketch pad. For screen printing, cotton fabrics, wooden frames of different sizes, silk mesh, gun tacker and pins, squeegee, machine oil, laser film, sensitizer and emulsion, printing ink, hypo bleach and printing table.

Size: 48.06 x 32.05cm/61.02 x 50.05 cm

Source: Awele (2017)

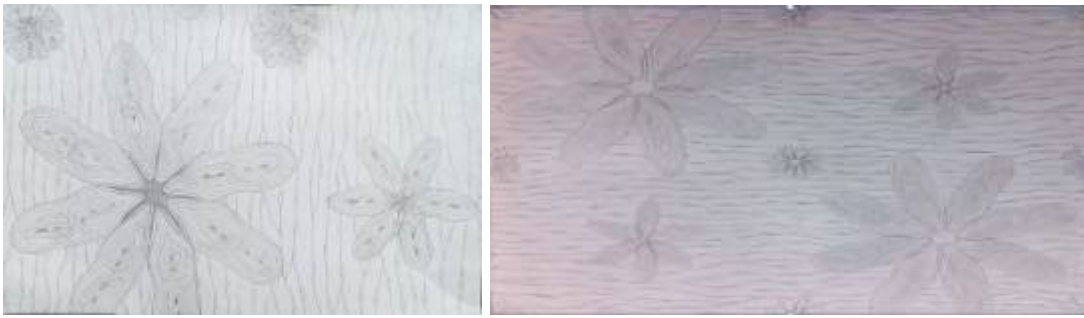


Figure 2: Thumbnail sketch with its diagonal repeat pattern

Medium: Pencil on Cardboard

Size: 48.06 x 32.05 cm/61.02 x 50.05 cm

Source: Awele (2017)

Stage 2: Colour Test

The thumbnail sketches were painted in different colour combinations as shown in Figures 3, 4, 5 and 6



Figure 3: Colour Test of four different colours

Medium: Gouage colour on Cardboard

Size: 38.08 x 24.09 cm



Figure 4: Enlarged colour test showcasing mirror repeat pattern

Medium: Gouage colour on cardboard

Size: 61.02 x 50.05 cm

Source: Awele (2017)



Figure 5: Colour Test of four different colours

Medium: Gouage colour on Cardboard

Size: 38.08 x 24.09 cm



Figure 6: Enlarged colour test showcasing diagonal repeat pattern

Medium: Gouage colour on cardboard

Size: 61.02 x 50.05 cm

Source: Awele (2017)

Stage 3: Colour Separation

Computer-Aided Design (CAD)

The colour separation was done using Computer-Aided Design (CAD) methods, the paper design was transferred to the computer system through Bluetooth and the colour separation was done with the use of a coral draw application. Each colour was done on a separate sheet and was later printed out on a laser film.

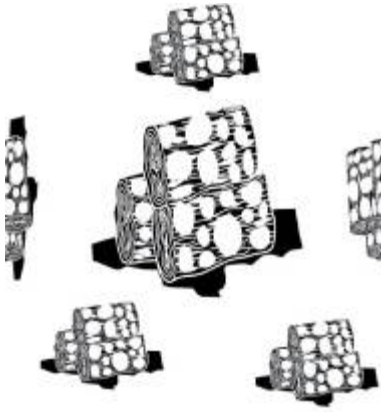


Figure 7: Photographic method of colour separation using (CAD)

Medium: printing on laser film

Size: 50cm by 70cm

Awele (2018)

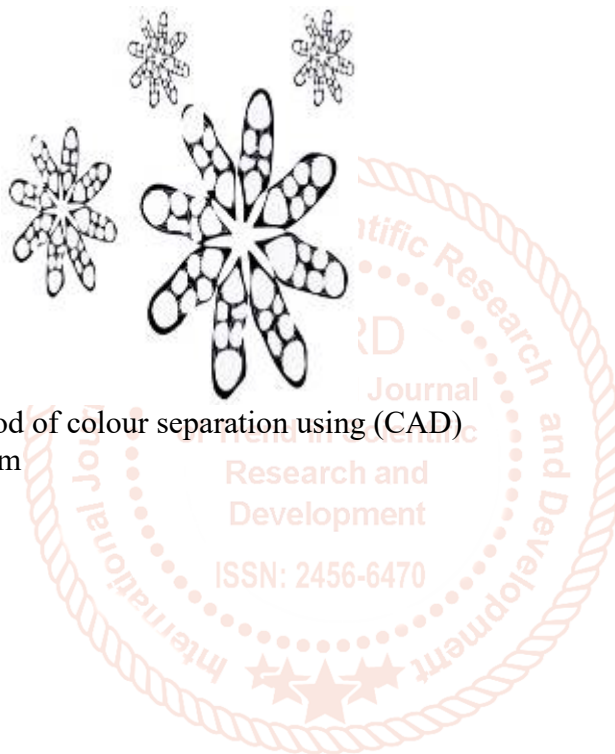


Figure 8: Photographic method of colour separation using (CAD)

Medium: printing on laser film

Size: 50cm by 70cm

Awele (2018)

Figure 9: Photographic method of colour separation using (CAD)

Medium: printing on laser

Size: 50cm by 70cm

Stage 4: Actual Test Print

Screen Printing

Silk mesh was tautly fastened onto a wooden frame with a gun tacker to build a screen. After the screen was made, the mesh was washed to remove the industrial starch, sensitized emulsion already mixed in a plastic container in the ratio of 1:4, was spread over the screen with a spreader. The coated screen was kept in the darkroom for 45 minutes and allowed to dry naturally after which it was brought out and the cut-wood design on the laser film was placed on it and kept on the sun for 10 seconds to enable the design to be exposed. The screen was then washed clean with water, placed under the sun to dry and retouched for pinholes. The ironed fabric was stretched on the printing table with office pins and the design images on the screen were placed over the fabric and the printing ink was poured on the mesh and squeegeed across the screen to press the ink through the mesh

onto the fabric. Each colour was allowed to dry before the second colour was applied. The fabric was dried and ironed at the wrong side to properly fix the ink on the fabric.

Studio Experiments, Results, and Analysis of Works

The experiment produced quite stimulating and high-quality aesthetic appealing designs on fabrics for the market and interior decorative items. The cut-wood designs were produced on fabrics in different colour combinations to create varieties. Examples of the works include, *Peace of Mind*, *Ngwa-Ngwa*, *Kpakpando* (Stars), *Ugbo-Amala* and *Ogige*, to mention just a few.



Plate 2: Peace of Mind

Medium: Tie and Dye and Printing on Fabric

Size: 5.486 metres

Source: Awele (2021)

The Peace of Mind is a 100% white cotton brocade fabric, tied and dyed in pink and purple colours and later printed on with the cut-wood design. The artwork has dual functions; it can serve as a wall hanging or a duvet to be used alongside the bed sheet. It is preferred to serve as such so that one can appreciate it as a unique functional textile piece as well as an interior decoration item. Wool Fibre was immersed in between the cotton brocade and the linen material to bring out the beauty and make the design display weight and volume.



Plate 3: Kpakpando (Star)

Medium: fabric and printing ink

Size: 4.572 Metres

Source: Awele (2021)

Kpakpando (Stars) is a printed Ankara design derived from flat sliced wood of different sizes and shapes, fashioned into stars to depict future glory as regards to the several challenges the new institution is facing at the moment. This set of wood are arranged in clusters, grouped into similar units, the small, the medium, and the large ones, each group coming together inform of quarantined waiting for a better tomorrow to blossom. The Kpakpando design was produced in different combination colours; (green, purple and black colours) and (blue, orange and black colours). The fabric can serve as wrapper materials for women or sown into men's wears, also be fashioned into functional items like laptop bags, tote bags, slippers, shoes etc



Plate 4: Ngwa-Ngwa
Medium: fabric and printing ink
Size: Size: 4.572 Metres
Source: Awele (2021)

Ngwa-Ngwa (Plate 4) is an Ankara fabric design. The motif comprises of three logs of wood of different sizes bound together on a moving platform facing different directions assumed to be on a top speed, “eager to run away from the unpleasant situation they were subjected to by man’s malicious activities to them in their habitat, to where hopefully, they could find peace. This shows that when trees are cut from their habitat without replanting, they tend to leave the environment never to come back, this results to lack of certain species of plant in an environment” (Ekwezia, 2023). They design was made in different colour combinations with different backgrounds colours and can be used for window blind, chairs and tables covers etc.

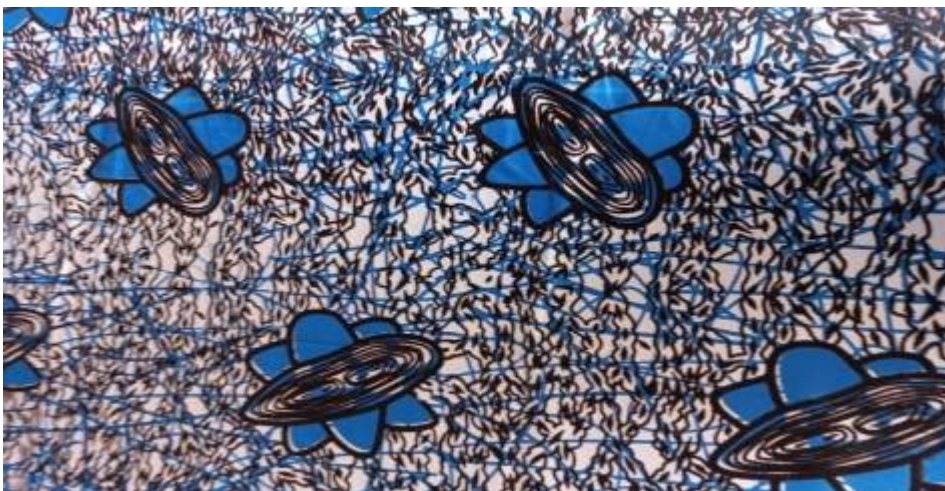


Plate 5: Ugbo-Amala Ankara Print
Medium: fabric and printing ink
Size: 1.525 Metres
Source: Awele (2021)

Ugbo-Amala (Figure 5) is a two coloured Ankara design printed on a towel, it comprises of sliced wood joined together, designed into simple repeat pattern. The towel was dyed in light blue colour and allowed to dry before the Ugbo-Amala design was printed on it, with blue and black printing Ink. The young institution needs unique products to create a niche for its self and the Ugbo-Amala towel can serve as a souvenir for matriculation and convocation ceremonies, conferences, workshops etc

Conclusions

The study, Computer-Aided Design (CAD): Printing and Production of Cut-Wood for Fabric Decoration used CAD software to produce intricate and precise designs/patterns that are fashioned into different Ankara fabrics and decorative items for office use and sales. Different developmental stages were employed to achieve the set objectives and these includes, the exploration of the forms and patterns of wood by drawing process to achieve a visual representation of the object on paper, from where images were adapted and transformed into motifs to produce series of thumbnail sketches, these thumbnail sketches were reproduced with different repeat patterns such as simple repeat, diagonal repeat, half drop, full drop repeat patterns etc and Computer-aided design (CAD) was used for colour separation and printed on a laser films and the films were exposed on mounted mesh coated with emulsion and sensitizer. Finally, the cut-wood design was printed on fabrics, using screen printing textile technique. The experiment shows that Computer-aided design (CAD) is an invaluable tool in textile art especially for the creation of striking and intricate designs such as cut-wood that translate into beautiful fabric decorations. The result of the experiment produced stimulating and high-quality aesthetic appealing Cut-wood designs on fabric and other decorate items for the good image of the Anambra State Polytechnics, Mgbakwu. Few works produced in the studio experiment include *Ngwa-Ngwa*, *Peace of Mind*, *Kpakpando* (Star), *Ugbo-Amala*, *On the Move*, and *Ogige* to mention but a few

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